DOCUMENT RESUME

ED 090 275 TM 003 551

AUTHOR Gray, Jerry L.
TITLE Stability and Generalizability of Conceptual Style.
PUB DATE Apr 74
NOTE 17p.; Paper presented at the Annual Meeting of the American Educational Research Association (Chicago, Illinois, April 1974)

EDRS PRICE MF-$0.75 HC-$1.50 PLUS POSTAGE
DESCRIPTORS *Academic Achievement; *Academic Performance; Child Development; Cognitive Development; *Conceptual Schemes; Generalization; *Grade 5; Individual Differences; Item Analysis; *Testing; Test Reliability; Test Validity
IDENTIFIERS *Cognitive Style; Conceptual Style Test; CST; SCST; Sigel Conceptual Style Test

ABSTRACT

The purposes of this study were to investigate (1) the consistency among fifth-grade children in conceptual style across different conceptual style instruments and (2) the generalizability of conceptual style behavior to school related tasks when stability and instability of children's conceptual style were taken into consideration. Children switching styles from one conceptual task to another performed significantly higher on five different school-related tasks than children using a consistent style across the conceptual tasks. The implications of these findings suggest that an individual's conceptual style as well as the nature of school-related tasks must be analyzed in relation to instructional materials and methods. (Author)

ED 090275

STABILITY AND GENERALIZABILITY OF CONCEPTUAL STYLE

Jerry L. Gray

The University of Iowa

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

The stability of conceptual style, as measured by a particular instrument, has been amply demonstrated with respect to both internal consistency and test-retest reliabilities (Cohen, 1972; Denney, 1971; Forehand, 1962; Wallach and Kogan, 1965). However, the low correlations between different conceptual style measures and the frequent nonsignificant relationships between conceptual style and cognitive achievement measures raise serious questions not only about the utility of the notion of conceptual style in relation to school learning, but also about the meaning of consistency in cognitive style as well (Coop and Sigel, 1971; Cronbach, 1968; Messick, 1970).

In an attempt to understand the seeming lack of internal and external validity of conceptual style, two common characteristics of research studies in this area must be considered. First, individual consistency has been studied at the exclusion of individual variability in the use of conceptual style. Second, conceptual styles of children have been identified based on performances on just one instrument (Sperry, 1973). The result has been that very little is known about the frequency of occurrence of children with single and multiple modes of conceptualization or the effects of such conceptual styles on school learning.

The present study focuses on three questions: (1) to what extent are children consistent in their use of conceptual style on similar conceptual tasks? (2) how prevalent is a single-mode style among children? (3) what

TM 003 551

are the effects of a child's using single or multiple modes of conceptualization in relation to school learning? The particular conceptual style dimension selected for investigation was identified by Kagan, Moss, and Sigel (1963). Consequently, three preferential modes of conceptualization were of interest: categorical-inferential (categorical); descriptive-analytical (descriptive), and relational-contextual (relational).

METHOD

Subjects:

Two hundred seventy-five fifth-grade children (146 boys, 129 girls) served as Ss. Ss were individually selected at random from eighteen classrooms in six schools in a southwestern urban community. Ss were representative of fifth-grade children in the school district based on IQ, educational achievement, and socioeconomic status. Measures of the above criteria were the Lorge-Thorndike Intelligence Test, the Stanford Achievement Test, and Warner's Index of Socioeconomic Status.

Tests:

The conceptual style tests used in this study were developed by Kagan, Moss, and Sigel (1963) and Sigel (1967). The first test, Conceptual Style Test (CST) has 19 items. The second test, the Sigel Conceptual Style Test (SCST), contains 35 items. Both tests consist of triad picture items. The difference in stimulus tasks for the two tests is that the CST has line drawings, while the SCST has photographs.

The response requirements for the two tests were identical. An S selected two of the three stimuli in each item which were alike in some way and gave a reason for his selection. The reason given for each item was then scored into one of three categories (categorical, descriptive, or

relational) in accordance with the scoring manual for the SCST. Both tests were group-administered in intact classrooms. Ss in half of the classrooms were randomly assigned the CST-SCST test order while the other half were assigned the SCST-CST test order.

The school learning tasks for this study were the verbal and nonverbal portions of the Lorge-Thorndike Intelligence Test and the reading and mathematics portions of the Stanford Achievement Test.

Characteristics of Conceptual Style Instruments:

Internal-consistency, test-retest reliabilities, and rater agreement on response categories for the CST and SCST have been thoroughly investigated (Brozovich, Hall, and Watson, 1972; Cohen, 1972; Davis, 1971; Denney, 1971). As found in previous investigations, a number of items on each instrument elicited only one response category. Three items on the CST elicited nearly all descriptive responses, while seven items on the SCST elicited nearly all categorical responses. In addition, most items on both instruments did not elicit more than two types of response categories. For the entire 54 items, the number of items eliciting between 25 and 75 percent response frequency for a particular response category were categorical, 39; descriptive, 36; and relational, 14. Point biserial correlations between item response and total item responses on items in which the response frequency was between 25 and 75 percent ranged from .18 to .59. Correlation coefficients were higher and less variable for relational than for categorical and descriptive responses.

Internal-consistency reliability coefficients (Spearman-Brown Prophecy Formula) for three mutually exclusive sets of 14 items, one set for each style category, were categorical, .79; descriptive, .80; and relational, .80.

Each set consisted of items eliciting from 25 to 75 percent response frequency for a particular style. Items which were suitable for both categorical and descriptive categories based on above percentage range were randomly assigned to only one of these categories. Test-retest reliabilities were obtained by administering, in two-week intervals, both the CST and SCST to 50 fifth-grade Ss, representative of but not Ss in this study. For the same set of items as was used to determine internal-consistency coefficients, test-retest reliabilities were categorical, .75; descriptive, .77; and relational, .80.

Reliabilities were relatively high then for sets of items which differentiated among Ss in their use of conceptual style responses. For items of similar response elicitations, Ss tended to be stable in their use of conceptual style on the same day and on different days.

RESULTS

Means and standard deviations for the CST and SCST administered in reverse order are presented in Table 1. There were no significant order

---

TABLE 1

---

effects. Neither did the content of CST affect performances of Ss on any of the style categories on the SCST nor did the content of SCST affect performances on any style category on the CST. A mean shift in style did occur for descriptive and categorical responses. Approximately 60 percent of the responses elicited on CST were descriptive and 30 percent were categorical. On the SCST, 50 percent of the responses were categorical whereas 30 percent were descriptive. Thus, Ss tended to shift styles from

one test to the other.

Using Davis' (1971) criteria of assigning Ss to style classifications if one-half or more of their responses on a test are of one particular response category, the following results were obtained for the CST, SCST, and a combination of the two tests (Table 2). Approximately twice as many

---

TABLE 2

Ss were classified as having a style on each of the two conceptual style tests as Davis found in his study of the SCST. However, among his fifth-grade Ss the percentages would have been the same as those reported here if Davis had combined descriptive-global and descriptive-part responses. The combination of test performances resulted in classifying one-third of Ss as having a conceptual style. This was the same percentage as that observed by Davis.

In view of the results of item analyses of the CST and SCST and mean shifts in response categories for the CST and SCST, a relative rather than an absolute criteria was used in assigning subjects to classification groups. Specifically, the median of style distributions on each test was used. The prevalence of single and multiple modes of conceptualization based on this criteria are reported in Table 3. It is important to note that various

---

TABLE 3

---

other classifications such as categorical on CST and descriptive on SCST were not present. The absence of such classifications, in addition to mean shifts in response categories from one test to the other, indicates that the nature of the conceptual task affected Ss' responses. Approximately

50 percent of Ss, however, used the same conceptual style on both tests.

Means and standard deviations of conceptual style scores, school learning scores, IQ, and socioeconomic status (SES) for each style classification group are given in Table 4. Conceptual style and school learning

---

TABLE 4

---

performances are presented in raw score form. IQ and SES were included as demographic information. SES was based on a seven-point rating scale in which one (1) represented a high SES and seven (7) represented a low SES (Warner, Meeker, and Eells, 1960).

Seventeen 7 x 2 factorial analyses of variance were performed to test for possible differences among conceptual style groups in school learning outcomes. In each analysis, Factor A was conceptual style and Factor B was sex. The dependent variables were subtest and total scores for verbal ability, nonverbal ability, reading comprehension, and mathematical skills. The summary of these analyses are given in Table 5. Unless

---

TABLE 5

---

results on a subtest analysis were different from results on the school learning test for main effects, interactions, and post-hoc analysis, the results of subtest analysis are not reported.

There were no significant sex main effects or interactions between style and sex for any school learning measure. With the exception of mathematical computations, significant differences were found for conceptual style main effects on each school learning measure.

Tukey's procedure (Winer, 1971) was used in post-hoc analyses of the style main effects. A summary of these analyses is reported in Table 6.

TABLE 6

These findings indicate that Ss using a multiple style in accordance with the nature of the task (descriptive-categorical) or in accordance with the nature of a particular item (no style) resulted in higher performance on school learning outcomes. In no instance did single mode style or other multiple style Ss facilitate school learning. Rather, the results suggest that the latter styles may hinder school learning.

DISCUSSION

Based on the results of this study, it might be concluded that the conceptual style tests were designed to measure a child's ability to use descriptive responses (CST) and categorical responses (SCST). It is up to the child, however, to discover the nature of the task on each test under the administrative directions. As was demonstrated in this investigation, children use a variety of styles to categorize the items on the two tests.

Perhaps specifying the nature of the tasks for Ss would drastically change performances on conceptual style tests. In a study by Cohen (1972), merely using a multiple-choice format increased categorical and decreased descriptive responses in comparison to using a free-response format for the CST. Studies by Baird and Bee (1969), Denney (1972), and Scott and Sigel (1965) have demonstrated that conceptual style can be altered under certain learning conditions. However, whether changing a child's conceptual

style would affect school learning is a question in need of further investigation.

Under the assumption that teachers do not typically adapt materials and methods to a child's conceptual style, it is not surprising that Ss who varied their style responses item-by-item (no style) or test-by-test (descriptive-categorical) in accordance with the conceptual task obtained higher performances across school learning tasks. What is surprising, in view of past research findings, was that disregard for situational factors (nature of the conceptual task) would have led to the conclusion that conceptual style is not related to school learning. This can be demonstrated by pooling school learning performances for Ss of like styles based on just one of the conceptual style measures (Table 4).

One direction that the findings of this study provide is the feasibility of identifying a learner's conceptual style for the purpose of adapting materials and methods to a child's preferential mode of conceptualization. Further studies should be conducted of content, materials, and methods which may affect the learning of children of single and multiple conceptual styles in view of the differential trends found in this study.

REFERENCES

Baird, R. R., and Bee, H. L. Modification of conceptual style preference by differential reinforcement. Child Development, 1969, 40, 903-910.

Brozovich, R., Hall, L. P., and Watson, R. Development of a scale to evaluate cognitive styles and abilities. Report to the Office of Education, U. S. Department of Health, Education, and Welfare, Cooperative Research Program, 1972.

Cohen, A. A multiple-choice test of conceptual differentiation: a reliability study. Unpublished Master's Thesis, University of Iowa, 1972.

Coop, R. H., and Sigel, I. E. Cognitive style: implications for learning and instruction. Psychology in the Schools, 1971, 8 (No. 2), 152-161.

Cronbach, L. J. Intelligence? creativity? a parsimonious reinterpretation of the Wallach-Kogan data. American Educational Research Journal, 1968, 5, 491-511.

Davis, A. J. Cognitive style: methodological and developmental considerations. Child Development, 1971, 42, 1447-1459.

Denney, D. R. The assessment of differences in conceptual style. Child Study Journal, 1971, 1, 142-155.

Denney, D. R. Modeling effects upon conceptual style and cognitive tempo. Child Development, 1972, 43, 105-119.

Forehand, G. A. Relationships among response sets and cognitive behaviors. Educational and Psychological Measurement, 1962, 22 (No. 2), 287-302.

Kagan, J., Moss, H. A., and Sigel, I. E. Psychological significance of styles of conceptualization. Society for Research in Child Development Monographs, 1963, 28, 73-112.

Messick, S. The criterion problem in the evaluation of instruction: assessing possible not just intended outcomes. In M. C. Wittroch and D. E. Wiley (Eds.), The Evaluation of Instruction: Issues and Problems. Holt, Rinehart, and Winston, 1970.

Scott, N. C., Jr., and Sigel, I. E. Effects of inquiry training in physical science on creativity and cognitive styles of elementary school children. Report to the Office of Education, U. S. Department of Health, Education, and Welfare, Cooperative Research Program, 1965.

Sigel, I. E. SCST (Form A Experimental Model) test materials and scoring manual. Merrill-Palmer Institute, 1967.

Sperry, L. Learning Performance and Individual Differences. Scott-Foresman, 1972.

Wallach, M. A., and Kogan, N. Modes of Thinking in Young Children. Holt, Rinehart, and Winston, 1965.

Warner, W. L., Meeker, M., and Eells, K. Social Class in America. Harper and Row, 1960.

Winer, B. J. Statistical Principles in Experimental Design. Second edition. McGraw-Hill, 1971.

TABLE 1

Means and Standard Deviations for CST and SCST in Reverse Order Administered

	Order of Test Administration*											
	CST1 - SCST2						SCST1 - CST2					
Response	$\bar{X}$	SD	%	$\bar{X}$	SD	%	$\bar{X}$	SD	%	$\bar{X}$	SD	%
Categorical	5.3	3.1	28	18.0	5.7	52	17.7	5.8	51	5.5	3.9	29
Descriptive	11.8	4.2	62	10.7	5.2	31	11.3	7.3	32	11.2	5.5	59
Relational	1.8	2.1	9	6.0	4.1	17	5.9	4.5	17	2.2	3.0	12

*N of 141 for CST1 - SCST2; N of 134 for SCST1 - CST2.

TABLE 2

Frequency of Ss in Style Categories Based on Fifty Percent Absolute Criteria for Conceptual Style Measures

Style	CST		SCST		Combination	
	f	%	f	%	f	%
Categorical	44	16	167	61	44	16
Descriptive	175	64	28	10	28	10
Relational	13	5	13	5	13	4
None	43	16	67	24	20	7

TABLE 3

Frequency of Ss in Style Categories Based on Median Split for Conceptual Style Measures

Classification			
CST	SCST	f	%
Categorical	Categorical	42	15
Descriptive	Descriptive	48	17
Relational	Relational	55	20
Descriptive	Categorical	39	14
Relational	Categorical	32	12
Descriptive	Relational	39	14
None	None	20	7

TABLE 4

Means and Standard Deviations of Conceptual Style, School Learning, and Demographic Variables for Style Groups

Variable	Style Group													
	Categorical		Descriptive		Relational		Relational Categorical		Descriptive Relational		Descriptive Categorical		No Style	
	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
CST														
Categorical	9.9	3.0	2.9	2.2	7.0	2.5	8.8	2.5	2.7	1.8	3.7	2.1	6.7	3.0
Descriptive	7.9	3.1	15.7	2.2	6.7	3.1	5.8	2.9	14.7	2.0	14.9	2.2	11.3	3.1
Relational	0.9	1.1	0.4	0.5	5.5	2.8	4.5	2.2	1.6	1.1	0.3	0.6	1.1	0.9
SCST														
Categorical	26.6	3.4	14.6	4.1	15.0	3.3	23.4	2.6	14.4	2.8	23.3	2.6	19.9	2.2
Descriptive	5.7	3.1	17.9	4.7	8.4	4.2	4.9	2.5	10.8	3.6	9.0	2.9	10.0	4.8
Relational	2.5	1.4	2.1	1.8	10.8	4.7	6.9	2.4	9.4	3.3	3.0	1.6	4.6	2.9
Verbal Ability	46.5	16.0	48.3	14.2	44.3	16.5	44.8	11.0	50.2	14.6	55.7	13.6	56.1	13.7
Nonverbal Ability	44.9	12.3	40.7	13.7	39.7	14.5	36.6	11.1	42.6	13.9	51.5	12.3	48.2	10.9
Reading Comprehension	46.7	19.6	49.8	17.1	46.4	18.9	48.1	13.9	51.4	18.2	58.8	17.4	62.7	15.6
Mathematical Skills	44.9	16.9	45.0	15.7	40.9	16.3	41.2	14.3	44.8	19.4	52.1	16.2	52.2	12.9
IQ	104.3	13.8	104.1	13.7	100.9	14.4	99.7	9.0	107.2	13.2	113.0	13.2	110.9	12.3
SES	4.6	1.8	4.5	1.5	4.6	1.7	4.8	1.5	3.8	1.5	3.9	1.6	3.2	1.7

TABLE 5

Summary of Analyses of Variance with School Learning as Dependent Variable

Variable	Source	df	MS	F-value
Verbal Ability	Style	6	761.7	3.38*
	Sex	1	459.6	2.04
	Interaction	6	169.5	0.75
	Within	242	225 5	
Nonverbal Ability	Style	6	954.6	5.24*
	Sex	1	46.4	0.26
	Interaction	6	200.0	1.10
	Within	242	182.0	
Reading Comprehension	Style	6	1134.0	3.44*
	Sex	1	221.3	0.67
	Interaction	6	232.0	0.70
	Within	242	330.1	
Mathematical Computation	Style	6	19.3	0.58
	Sex	1	57.2	1.71
	Interaction	6	33.6	1.00
	Within	242	33.5	
Mathematical Concepts	Style	6	140.9	3.32*
	Sex	1	116.9	2.76
	Interaction	6	46.6	1.10
	Within	242	42.3	
Mathematical Problem Solving	Style	6	139.8	3.20*
	Sex	1	58.1	1.33
	Interaction	6	91.4	2.09
	Within	242	43.6	

*$p < .01$

TABLE 6

Summary of Post-Hoc Analysis for Style Main Effects

Variable	Style Main Effect	Style Group (1) Categorical	(2) Descriptive	(3) Relational	(4) Relational Categorical	(5) Descriptive Relational	(6) Descriptive Categorical	(7) No Style
Verbal Ability	6			*	*			
	7			*				
Nonverbal Ability	6		*	*	*	*		
	7				*			
Reading Comprehension	6	*		*	*			
	7	*		*	*			
Mathematical Computation	6							
	7							
Mathematical Concepts	6			*	*			
	7				*			
Mathematical Problem Solving	6			*	*			
	7			*	*			

*p < .05